3 What's Your Watershed Address?

Questions to consider

1. What is a watershed? Which watershed do you live in?
2. How does the watershed affect the water body into which it drains? How do human activities affect the quality of water in a watershed?
3. What is point-source pollution? What is non-point pollution?
4. What is erosion? What causes it?
5. What is sediment? Where does it come from?
6. How does human activity affect erosion and sedimentation? What is the impact of erosion and sedimentation on aquatic resources?
7. What are Missouri's physiographic regions?

It's usually difficult to see a **watershed** unless you're standing on top of a ridge or looking down from an airplane. Then you can see all the hills and valleys that drain water into a stream, streams into rivers and rivers into lakes. (FIG 3.1) A watershed is all the land from which water drains into a specific body of water. Sections of connected hills and valleys form each watershed. Everyone lives in a watershed, and all land on Earth is part of some watershed. A watershed might be as small as your yard or millions of square miles. If you stand atop the ridge that divides two watersheds, you can pour a glass of water from one hand into one watershed and a glass of water from the other hand into a different watershed. Sooner or later, the water from the two different glasses will end up in two different streams.

Your watershed address

Missouri is a part of the largest watershed in the United States, the Mississippi River watershed. Although this watershed is 1.2 million square miles, it has many smaller watersheds and tributaries within it. These small (sub-) watersheds make up larger ones. For example, the Missouri River watershed is a sub-watershed of the Mississippi River watershed, just as the Missouri is a **tributary** (smaller branch) of the Mississippi. (FIG 3.2) And the Osage River watershed is a sub-watershed of the Missouri River watershed, just as the Osage River is a tributary of the Missouri River. Your **watershed address** is the watershed, sub-watershed, sub-sub-watershed, etc. in which you live. It tells which lake, stream or wetland collects the water that falls on your home. (FIG. 3.3)

At the top of the watershed is the land known as the **headwaters**. This is the high ground where precipitation first collects. From the headwaters it flows downhill in tiny trickles too small to create a permanent **channel**. When these trickles finally combine and

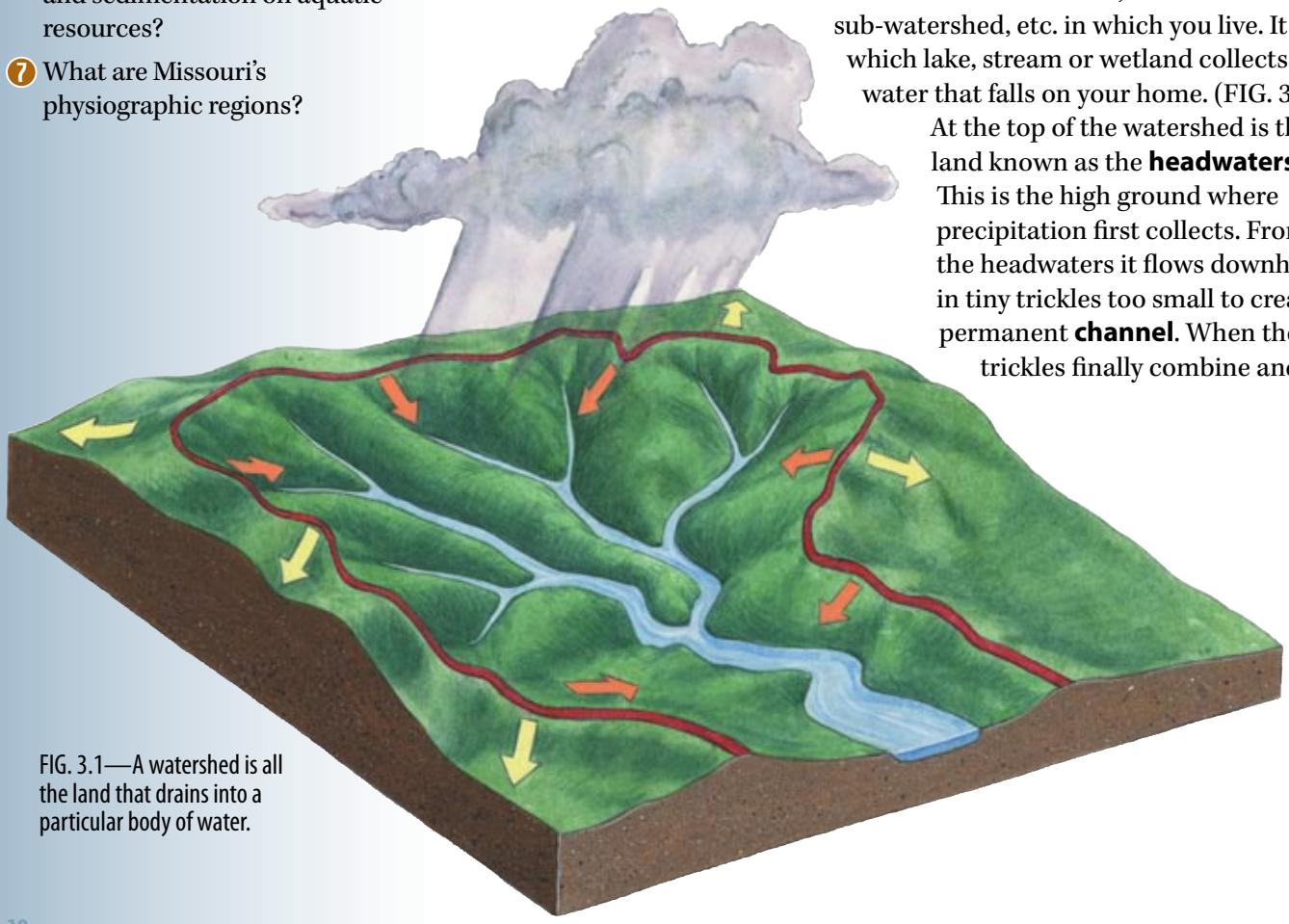


FIG. 3.1—A watershed is all the land that drains into a particular body of water.

begin carving a channel, they form a small stream. Small streams combine to form larger streams. The mouth of a stream is the place where it empties into a larger body of water. A permanent or **perennial stream** is one that has flowing water in it all year long. In the Ozarks, many streams only flow for part of the year, although water may be flowing just below ground, beneath the dry bed. Such streams are called **intermittent streams**, and they are marked on maps with blue dashes and dots.

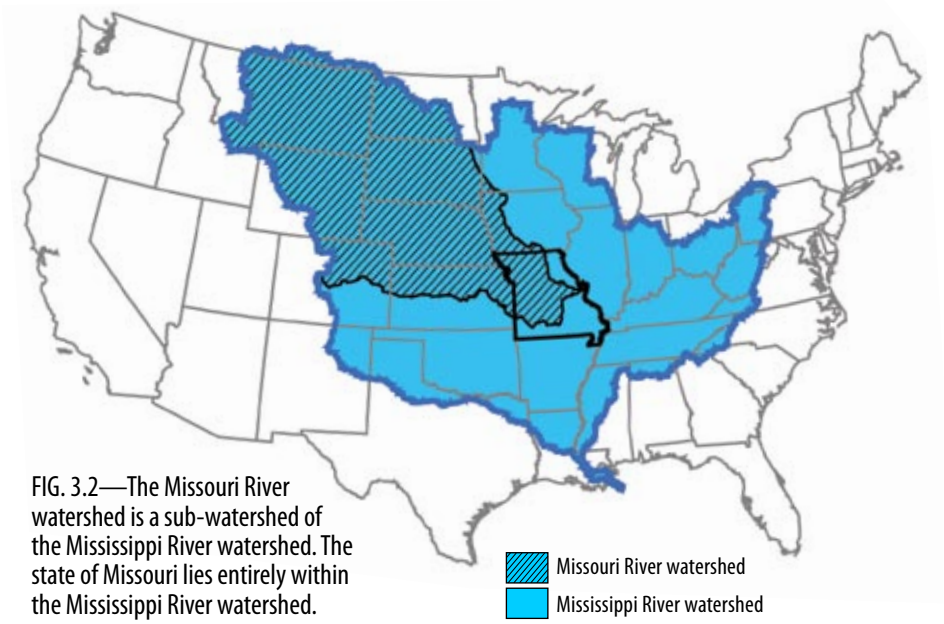


FIG. 3.2—The Missouri River watershed is a sub-watershed of the Mississippi River watershed. The state of Missouri lies entirely within the Mississippi River watershed.

What you do to the land, you do to the water

Everything that happens on the land in a watershed affects the water body into which it drains. A stream, pond or wetland can only be as healthy as its watershed. How we use the land affects the health of our aquatic resources. In a healthy watershed, water is filtered and stored. As water runs downhill, it picks up whatever is on the ground. When it flows through cities or across fields and pastures, water picks up dirt, pollutants and heat. These contaminants flow into a stream, wetland or lake, affecting the water you use to drink, swim or fish. When you flush your toilet, do the laundry, fertilize your lawn or dump used oil on the ground, you are affecting water quality in your watershed.

We describe sources of water pollution in two ways. One way is **point-source pollution**. Point-source pollution comes from a single source, such as a pipe. The other way, **non-point pollution**, comes from a combination of many sources rather than a single outlet. Examples of non-point pollution include runoff from fields and strip mines, fertilizers used on lawns and golf courses, fuel, oil and antifreeze from roads and animal waste and bacteria from feedlots. Finding and preventing water pollution in our state is vital to every Missourian's quality of life. What do you think is the biggest pollutant in Missouri's waters? Sewage? Industrial chemicals? Pesticides? Plant nutrients (fertilizers)? Trash? Believe it or not, the biggest pollutant of Missouri's waters is plain old dirt.

The proper name for dirt is soil, and when it gets into a water body, it becomes **sediment**. The biggest pollution problem in Missouri's waters is excess sediment. Sediment is any bit of rock or soil such as mud, clay, silt, sand, gravel—even boulders. Excess sediment blocks out light, killing aquatic plants or preventing their growth. Sediment covers up the nooks and crannies animals live in. It smothers aquatic animals by clogging their gills and by reducing the amount of oxygen in the water.

Raindrops can move mountains

Raindrops fall at a speed of about 30 feet per second, or 20 miles an hour (FIG 3.4). When a raindrop strikes bare soil it creates mud that is splashed as much as 2 feet high and 5 feet away. This is an example of **erosion**. Erosion is the movement of solid material such as soil, mud and rock. It is a natural process caused by the forces of wind, water, ice, gravity and living things. In fact, a certain amount of erosion and sediment is natural. However, too much of either can cause problems. Erosion can reduce soil fertility and water quality. Sediment that erodes from one place is carried away and settles out downstream. This can clog streams with gravel and fill reservoirs with sediment. Erosion

FIG. 3.4—Raindrops fall at a speed of about 30 feet per second, or 20 miles an hour and can splash mud as much as two feet high and five feet away.

can be a big problem in areas where too many trees are cut down or overgrazing or construction speeds up the natural process. Planting trees and building terraces are two ways to slow erosion. Plant leaves and stems slow moving water down, and plant roots hold soil and rock in place. Missouri farmers have switched to no-till planting and other conservation farming techniques to reduce the amount of soil and other sediment in Missouri streams. But excess erosion and sedimentation in Missouri's waters remains the biggest single problem facing our state's aquatic resources. (FIG. 3.5)

We can often see the close tie between land and water. Missouri has five **physiographic** regions. (FIG. 3.6) These five regions have different types of bedrock and soil, different elevations and plants and even slightly different kinds of weather. The different geologic forms and the different ways their land is used affect the overall water quality and quantity of their watersheds. The five regions are the Ozarks, Osage Plains, Southeastern Lowlands or the Bootheel, Dissected Till Plains and the St. Francois Mountains. Every stream, lake or wetland is a reflection of its watershed. Knowing our watershed and its relationship to surrounding watersheds can help us conserve our aquatic resources.

CLIFF WHITE

JIM RATHERT

FIG. 3.5—The biggest pollutant of Missouri's waters is soil and other sediment caused by accelerated erosion.

DAVID STONNER

Hydrologists study the hydrosphere

To collect water data, hydrologists make tests and measurements such as flow rate, dissolved oxygen, sediment load, acidity, saltiness, groundwater levels and pump tests. These data help hydrologists learn about surface watershed and groundwater aquifer characteristics and water quality. Hydrologists write reports and prepare water-level maps, geologic cross-sections, tables and graphs of study results and data analyses. These are published in government documents or scientific journals or as support for projects or large-scale investigations. Most hydrologists have at least a bachelor's degree; many have master's level education and certification as professional engineers.

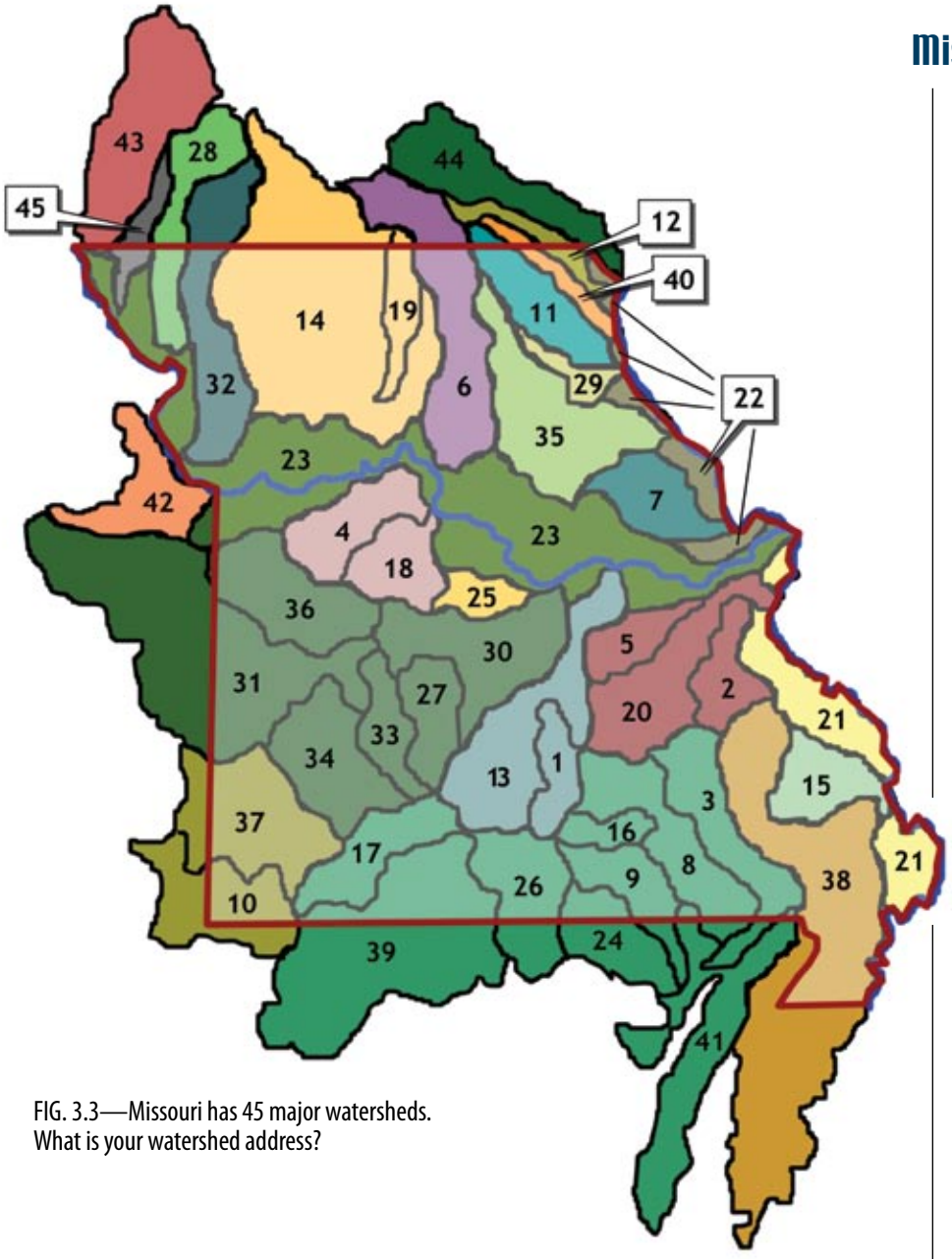
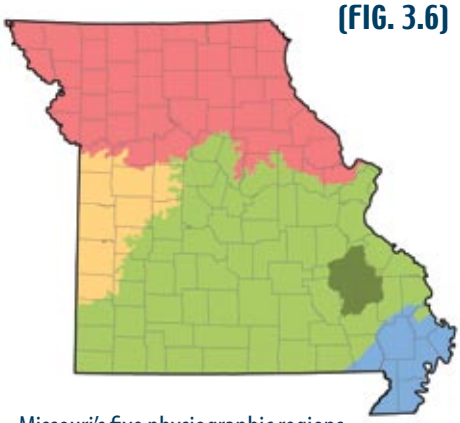


FIG. 3.3—Missouri has 45 major watersheds. What is your watershed address?

1—Big Piney River
2—Big River
3—Black River
4—Blackwater River
5—Bourbeuse River
6—Chariton River
7—Cuivre River
8—Current River
9—Eleven Point River
10—Elk River
11—Fabius River
12—Fox River
13—Gasconade River
14—Grand River
15—Headwater Diversion
16—Jacks Fork River
17—James River
18—Lamine River
19—Locust Creek
20—Meramec River
21—Mississippi River, Lower
22—Mississippi River,Upper
23—Missouri River
24—Spring River
25—Moreau River
26—North Fork White River
27—Niangua River
28—Nodaway River
29—North River
30—Osage River, East
31—Osage River, West
32—Platte River
33—Pomme de Terre River
34—Sac River
35—Salt River
36—South Grand River
37—Spring River
38—St. Francis River
39—White River
40—Wyaconda River
41—Cache River
42—Lower Kansas River
43—Nishnabotna River
44—Lower Des Moines River
45—Tarkio River

Missouri's physiographic regions (FIG. 3.6)



Missouri's five physiographic regions affect Missouri's waters and watersheds.

The Dissected Till Plains

The Dissected Till Plains region of northern Missouri is the product of the leading edge of the last ice-age glacier that once covered parts of North America. Deposits of soil and fine rock dust erode into silt, leaving the rivers of this region a very muddy color.

The St. Francois Mountains

The St. Francois Mountains region displays Missouri's oldest rocks. These igneous formations were once volcanic islands above the ancient shallow seas that covered Missouri.

The Osage Plains

The Osage Plains in west-central Missouri consist of rolling plains. The rivers in this region twist and turn through prairie grasslands that have deep, rich soils. As a result, these rivers carry more silt than Ozark streams.

The Ozarks

The Ozarks region lies on sedimentary rocks such as limestone and dolomite left millions of years ago by ancient seas. Today we see these rocks as ridges and bluffs. Geologic features such as caves, sinkholes, springs and losing streams are known as karst, formed by water's ability to dissolve away the limestone and dolomite bedrock into a sort of stone Swiss cheese.

The Bootheel

The Bootheel is the start of the Mississippi Delta. It is full of gravel and sand left by the Mississippi River. This region was once a vast swamp. Natural wetlands still exist in a few places and flooding still occurs, reminding residents that the natural path of the Mississippi once flowed over this land.